

# Portable Spectroscopic Scanning Electron Microscope on ISS: In-Situ Nanostructural/Chemical Analysis for Critical Vehicle Systems, Phase I

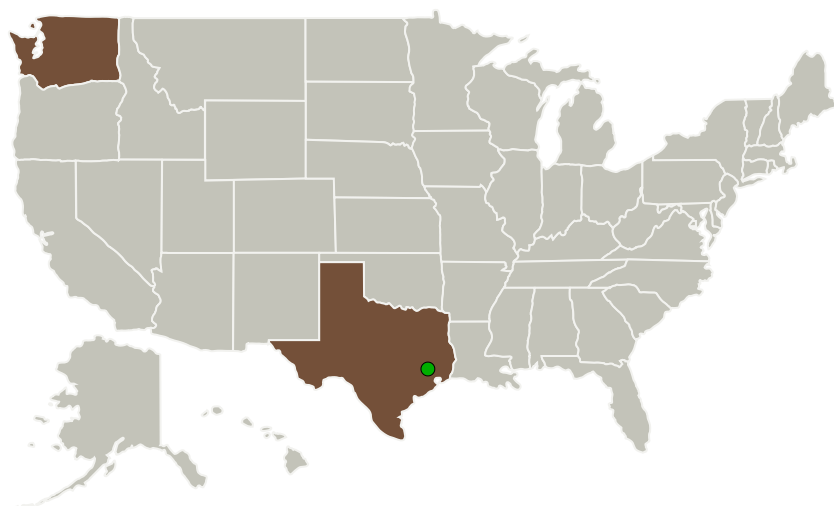
Completed Technology Project (2017 - 2017)



## Project Introduction

We will construct a novel field-portable miniature analytical electron microscope (EM+EDS) called Mochii "S" for in situ sensing in harsh/remote environments such as orbital and deep space flight. This lightweight, ISS-ready nano-analyzer will provide direct observation and chemical identification of the fine structure and correlated function of materials, contaminants, and biological agents down to the nanoscale. Nanostructural and spectroscopic analyses -- key ground capabilities -- can for the first time be launched with exploration vehicles and operated in-situ by virtue of unprecedented (10-100x) volume and weight reduction over traditional ground-based advanced analytical tools. Benefits include zero-latency nanoscale diagnosis and evolution tracking of previously invisible mission threats (i.e., presenting at the microstructural level and below) facilitating rapid mission team response and novel science. Phase I will demonstrate a system capable of imaging structures well below the diffraction limit of visible light (below 350 nm) concurrent with chemical identification of species via X-ray spectroscopy, at orders of magnitude lower cost, size, and weight than any existing EM system. Native tablet-based wireless control enables remote and concurrent multi-node use, mirroring current orbital mission control systems. The system will achieve TRL 6 and be subsequently improved to be flight-ready (TRL 8+) in Phase II enabling in situ sensing and observation for life support systems, engineering systems, and new science on ISS and Orion spacecraft.

## Primary U.S. Work Locations and Key Partners



Portable spectroscopic scanning electron microscope on ISS: in situ nanostructural/chemical analysis for critical vehicle systems, Phase I Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
Mochii, Inc., D/B/A Voxa	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Seattle, Washington
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

## Primary U.S. Work Locations

Texas	Washington
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## Project Transitions



**June 2017:** Project Start



**December 2017:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140757>)

## Images



### Briefing Chart Image

Portable spectroscopic scanning electron microscope on ISS: in situ nanostructural/chemical analysis for critical vehicle systems, Phase I Briefing Chart Image (<https://techport.nasa.gov/image/126001>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Mochii, Inc., D/B/A Voxa

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

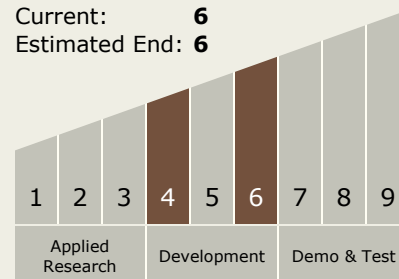
Carlos Torrez

### Principal Investigator:

Christopher Own

## Technology Maturity (TRL)

Start: 4  
Current: 6  
Estimated End: 6



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## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.1 Detectors and Focal Planes

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System